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GRIZZLY BEAR STUDY
ANNUAL REPORT

APRIL 1983 - MARCH 1984



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United States Borax and Chemical Corporation
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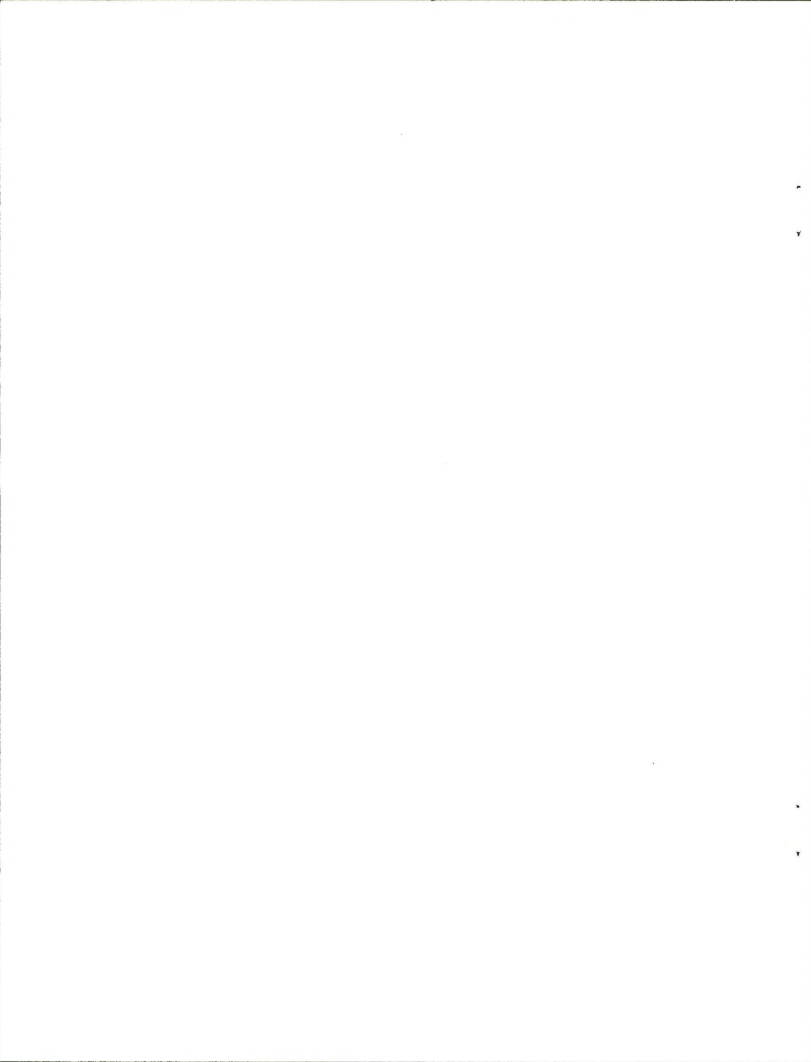
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TABLE OF CONTENTS

Table of Contents.....	2
List of Tables.....	3
List of Figures.....	4
Abstract.....	5
Introduction.....	6
Objectives.....	6
Study Area.....	7
Methods.....	10
Results and Discussion.....	11
Historical and Current Grizzly Bear Distribution.....	11
Trapping.....	15
Grizzly Bear Trapping and Population Data.....	16
Black Bear Trapping and Population Data.....	16
Home Range and Movements.....	22
Grizzly Bear.....	22
Black Bear.....	24
Habitat Characteristics.....	27
Grizzly Bear.....	27
Black Bear.....	30
Literature Cited.....	34
Appendix.....	37



LIST OF TABLES

Table

1. Known grizzly bear kills in the Cabinet Mountains, 1950-1983 (information compiled from Halvorson 1974, Madel 1983, K.R. Greer Pers. Comm.).
2. Physical measurements of grizzly 678 captured in the Cabinet Mountains, 1983.
3. Capture dates, sex, age, ear tag, weight, location, and color of black bears captured in the Cabinet Mountains during 1983.
4. Numbers of captured male and female black bears classified by coat color on two study areas in the Cabinet Mountains during 1983.
5. Numbers of captured male and female black bears classified by coat color from the west side of the Cabinet Mountains during 1980 (Thier 1981).
6. Numbers of black bears observed during fall helicopter shrubfield surveys in the Cabinet Mountains during 1983 (Brown et al., Unpub. P-R Job Prog. Rept. W-130-R-15, In Press).
7. Home range sites of radio-collared black bears in the Cabinet Mountains during 1983.
8. Summer and fall percentages of grizzly bear radio locations in various habitat components.
9. Summer and fall percentages of grizzly bear radio locations in various habitat types.
10. Summer and fall percentages of grizzly bear radio locations in various land types.
11. Summer and fall percentages of black bear radio locations in various habitat components.
12. Summer and fall percentages of black bear radio locations in various habitat types.
13. Summer and fall percentages of black bear radio locations in various land types.
14. Habitat parameters from den sites of radio collared black bears in the Cabinet Mountains during 1983.
15. Long term average temperature and precipitation data from Libby Ranger Station (U.S. Dept. of Comm. 1981).
16. Descriptions of habitat components. Excerpted from Madel (1982).
17. Criteria for verification of grizzly bear sightings or sign (Compiled by R. Kuennen, USFS and W. Kesworm, MDFWP).

LIST OF FIGURES

Figure

1. Map of study area in the Cabinet Mountains, Montana..... 9
2. Distribution of known grizzly bears kills in the Cabinet Mountains, 1950-1983 (Numbers refer to Table 1).....12
3. Seasonal distribution of grizzly bear sightings, 1959-1983..14
4. Trap success by time period. Trap success expressed as a percent of operational snares capturing bears each night....15
5. Minimum home range of grizzly bear 678 in the Cabinet Mountains during 1983.....23
6. Minimum home ranges of radio collared black bears in the Cabinet Mountains during 1983.....25
7. Minimum homes ranges of radio collared black bears in the Cabinet Mountains during 1983.....26
8. Percentages of grizzly bear radio locations classified by various aspect categories.....28
9. Percentages of black bear radio locations classified by various aspect categories.....31

ABSTRACT

The Cabinet Mountains grizzly bear study began in April of 1983 through funding provided by U.S. Borax and Chemical Corporation. Two and one-half months of trapping effort resulted in 40 black bears and one grizzly captured. The grizzly was a 28.5 year-old lactating female. However, no young were subsequently observed with the bear. Radio collars were placed on five black bears and the grizzly. Bears were radio tracked through the denning period. Minimum home range for the radio-collared grizzly was 429.9 Km². Radio-collared black bears had home ranges that varied from 6.7 km² to 126.1 km². Track measurements, verified with hair samples, indicated the presence of at least two additional grizzlies occupying the same portion of the study area as the instrumented female. Habitat characteristics of ranges used by black and grizzly bears are reported and discussed.

INTRODUCTION

The grizzly bear (*Ursus arctos horribilis*) is currently listed as a "threatened species" in the 48 adjacent states under the provisions of the 1973 Endangered Species Act. Six ecosystems were identified as supporting self-perpetuating or remnant grizzly populations (USFWS 1981). The Cabinet-Yaak Ecosystem (CYE) was one of three ecosystems designated by the recovery plan for concentrated recovery effort.

The CYE is located in northwest Montana and northern Idaho. There is concern that human developments along U.S. Highway 2 are fragmenting the 4856 km² (1875 mi²) CYE and creating an "island" population in the Cabinets (southern half). The Yaak (north half) borders Canadian grizzly populations to the north. Occupied habitat south of Hwy. 2 covers about 3590 km² (1386 mi²) and about 1269 km² (490 mi²) north of Hwy. 2.

The Cabinets have recently been subjected to increasing resource demands through mineral exploration, timber harvest and human recreation. The division of the CYE makes the Cabinet grizzly population more vulnerable to these impacts due to low population size. In response to potential impacts from these activities, the Montana Department of Fish, Wildlife and Parks (MDFWP) initiated the Cabinet Mountains Grizzly Study which began in April of 1983 through funding provided by U.S. Borax and Chemical Corporation. Funding was also obtained from the U.S. Fish and Wildlife Service (USFWS) and will be utilized during the 1984 spring trapping season.

Existing information on grizzly bears in the Cabinets consists largely of surveys and habitat and examination of reports of sightings and sign (Hamlin and Frisina 1974, Erickson 1976, 1978, Joslin et al. 1976, Moore and Gilbert 1977). From 1979 to 1980 an unsuccessful effort was made to capture and radio-collar a grizzly in the Cabinet Mountains (Thier 1981). A large portion of the Cabinets has been grizzly bear habitat component mapped through use of a procedure described by Madel (1982). Present U.S. Forest Service (USFS) grizzly habitat management is based on the Cumulative Effects Analysis Process (Christensen 1982) and Management Prescriptions for the Integrated Forest Plan (USFS 1983).

OBJECTIVES

1. Review and analyze all previously collected data on grizzly bear distribution, movements, habitat-use, and habitat preference in the Cabinet Mountains.
2. Initiate grizzly bear studies through trapping and radio tracking instrumented individuals.
3. Conduct intensive field studies to determine seasonal distribution, movement corridors, habitat-use and preference, food habits, and behavioral patterns of radio-collared grizzlies. Habitat cover will be analyzed to determine characteristics of plant communities used by grizzly bears. Critical bear use areas and habitats will be identified within the study area.

4. Determine the impacts of mineral exploration and development, timber harvest, and other human activities on bear behavioral patterns, distribution, habitat-use, productivity, and biological status. This information will be used to make recommendations and guidelines to protect and maintain grizzly bear populations and important habitat.
5. Conduct black bear studies (Ursus americanus) incidental to grizzly investigations to determine interspecific interactions and determine the impacts of these human activities on black bears. Black bear productivity, population status, habitat-use, distribution, movement, and behavioral data will be gathered and analyzed.

STUDY AREA

The Cabinet Mountains are located in Lincoln and Sanders counties of northwest Montana and Bonner and Boundary counties in northern Idaho. The mountain range extends along north-south trending faults between the Clark Fork River on the south and the Kootenai River 56 km (35 mi) to the north. The East and West Cabinets are separated by the Bull River which flows south to the Clark Fork River and Lake Creek flowing north to the Kootenai River (Fig. 1). Most of the CYE grizzly bear habitat is on public land administered by the Kootenai, Lolo and Panhandle National Forests. Plum Creek Timber Company and St. Regis Paper Company are the main corporations holding significant amounts of land in the area. Individual ownership exists primarily along the major rivers and creeks and numerous patented mining claims along the Cabinet Wilderness boundary. The Cabinet Wilderness is an elongate area covering 381 km² (147 mi²) of the upper elevations in the East Cabinets.

The Cabinets are a rugged range of mountains shaped by alpine and continental glaciation during the Pleistocene. Elevations range from 610 m (2000 ft) along the Kootenai River to 2664 m (8738 ft) atop Snowshoe Peak. The climate is characterized by short, warm summers and heavy, wet winter snowfalls. Average monthly temperatures at Libby vary from 19.4°C (67°F) in July to -5.3°C (22.4°F) in January. Annual precipitation varies from 49.3 cm (19.4 in) in the valleys to 280 cm (110 in) in some mountainous areas. (Appendix Table 15). Most mountain precipitation occurs as snow. Heavy snow accumulation and the resultant mountain avalanches maintain many of the seral shrub and forb fields thought to be important foraging areas for grizzlies during spring and summer. Valley bottoms to upper slopes are heavily forested with stands of mixed conifers. The Cabinet Range is vegetatively diverse with six habitat type series represented (Pfister et al. 1977). River bottoms are also diverse with mixed stands of coniferous and deciduous trees interspersed with riparian shrubfields and wet meadows. The study area has also been described by Joslin (1980).

Current resource development demands in grizzly bear habitat center around mineral exploration and extraction, timber harvest, and recreation. ASARCO operates the Troy mine complex 3 km west of Bull Lake. This facility began operation in 1979. Silver and copper are the primary minerals extracted. Mineral exploration activity centers in the southwestern portion of the Cabinet Wilderness Area. The Revett Formation, a quartzite bearing strata in the middle of the Belt Supergroup (Precambrian Rocks), crops out extensively in the vicinity of St. Paul Peak where it contains copper and silver deposits (Bannister et al. 1981). ASARCO and U.S. Borax conducted intensive exploration in this area until December 31, 1983. Congress imposed a 20 year limit on mineral exploration in wilderness areas in the 1964 Wilderness Act. Exploration will continue outside the wilderness and on validated claims inside the wilderness.

Recreation and other demands involve wilderness designations and a proposed ski area. The West Cabinets (Scotchman Peaks) and areas adjoining the Cabinet Wilderness are under consideration as additions to the wilderness system. On the east side of the main Cabinets, a ski area has been proposed on Great Northern Mountain. The U.S. Forest Service is reviewing this proposal (Madel 1983).

Timber harvest is the principal land management activity over much of the CYE. During January of 1984, there were 126,124,000 board feet of timber (on 33.3 km²) in active sales or under contract in occupied grizzly bear habitat on the Kootenai National Forest south of U.S. Highway 2 (A. Bratkovich, E. Garcia, and D. Henry, Pers. Comm.).

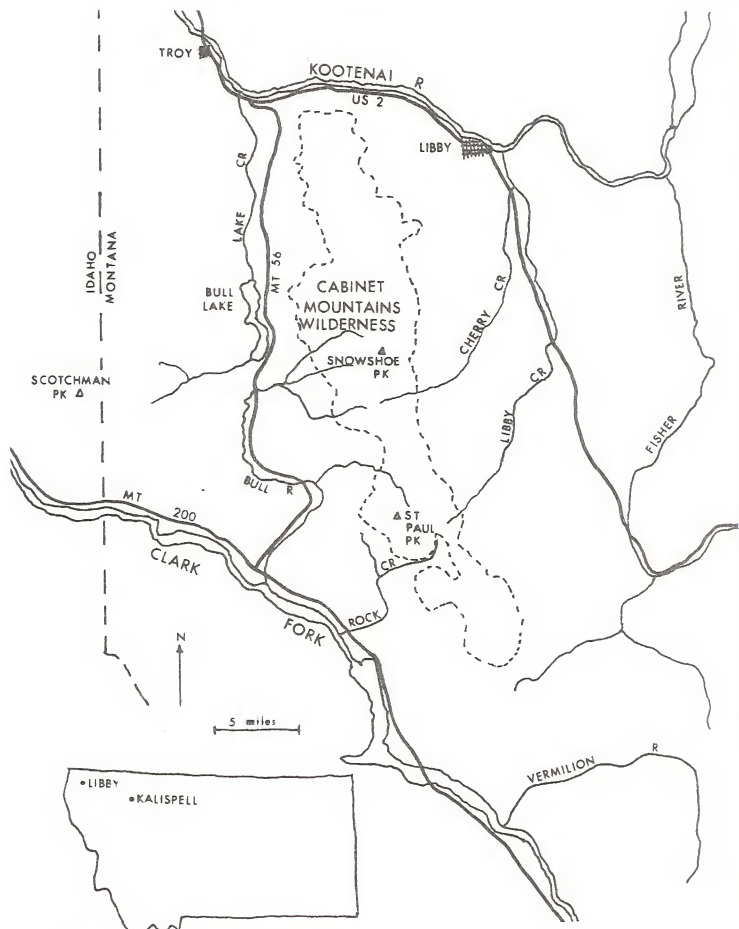


Figure 1. Map of study area in the Cabinet Mountains, Montana

METHODS

Bears were trapped with foot snares (Aldrich Snare Company, Clallam Bay, Washington) in cubbies or trail sets baited with road-killed deer and miscellaneous meat scraps. Scraps of bait were dragged along roads and trails to produce scent trails to attract bears to cubbies. About halfway through the trapping season, snares were boiled for several hours with bark, needles, leaves and paraffin. From that point, snares were handled only with gloves, but this procedure appeared to make little difference in trap success. Warning signs were posted to minimize bear/human encounters. Snares were checked daily by vehicle and/or on foot.

Captured bears were immobilized with ketamine hydrochloride (Ketaset or Vetalar) and xylazine (Rompun). Phencyclidine hydrochloride (Sernylan) and promazine hydrochloride (Sparine) were used on large and unusually aggressive individuals. Dosages used are reported by Perry (1978). Bears were darted with a Palmer Cap-chur gun.

Plastic ear tags (Rototags) were used to mark captured bears. One numbered tag was placed in each ear. Although each ear held a different number, the tags were usually sequential. Physical measurements of the bear were also taken. Scale weights were obtained from as many bears as possible. The first premolar was extracted and used to determine the age of the individual by counting cementum annuli (Stoneberg and Jonkel 1966).

Selected black bears were fitted with radio collars in the 150.000 MHz range (Telonics, Mesa, Arizona). The only grizzly captured was fitted with a 164.000 MHz range transmitter. Radio instrumented bears were monitored from air and ground. Aircraft used for relocations included a Cessna 180, Cessna 182, and Piper Supercub. All planes were equipped with a twin antenna system and a switchbox. Locations were plotted on 1:24,000 USGS topographic maps by Universal Transverse Mercator (UTM) coordinates. Home ranges were calculated by the minimum (Mohr 1947, Hayne 1959) and modified minimum (Harvey and Barbour 1965) methods and measured with a planimeter. Radio locations were also classified by habitat type (Pfister et al. 1977), grizzly bear habitat component (Appendix Table 16), land type (USFS 1984), elevation, slope, aspect, topography, and decade of burn where applicable. Radio locations within timber harvest areas were classified by silvicultural methods, year of harvest, and site preparation method. Roads and trails will be classified by use and distance measurements from radio locations will be used to examine their relationships to bear distribution. Statistical analyses was performed through use of the computer package MSUSTAT (Lund 1983).

Several radio locations were visited to determine the bear activity at the site. If activity could be determined or some sign located, a circular vegetation plot (375m²) was delineated. Vegetation canopy coverage and structure were recorded. Plant nomenclature followed Hitchcock and Cronquist (1973). Seasons were defined as Spring (den emergence - June 30), summer (July 1 - August 15), and fall (August 16 - denning).

Scats were collected, tagged, and frozen for food habit analysis. Only scats accompanied by other sign (tracks, hair, or radio locations from instrumented bears) were considered to be grizzly.

Real time motion sensing collars aided in determining activity patterns through continuous monitoring for 24 hour periods. Motion sensing collars emit two different pulse rates dependent upon orientation of the collar. Bears were monitored every one-quarter to one-half hour to record signal strength, constancy, mode, and location. Motion sensitive collars were used only on grizzlies.

Bear dens were located by chance and reports from individuals. Physical and vegetation data were recorded about the site as well as the condition and type of den.

Information about historical distribution and kills was gathered from existing documentation and personal interviews with long time residents or persons familiar with the observation. Veracity of all reports was determined by the interviewer and only those judged reliable are included in this report. Criteria used to judge reliability of sightings and sign are shown in Appendix Table 17.

RESULTS AND DISCUSSION

Historical and Current Grizzly Bear Distribution

Distribution and a listing of 35 known grizzly bear kills in the Cabinet Mountains from 1950 to the present are shown in Figure 2 and Table 1 respectively. The number indicated may in no way reflect total man-caused mortality during the specified time frame. Illegal kills probably occur, but the magnitude of this mortality factor is unknown. Of the total known legal and illegal kills, 11 were adult females. For the period indicated by the time span between the earliest and latest known kills, an average of 1.35 mortalities/year was calculated. The list will be updated as more information becomes available. A special licensing system for grizzly bear hunters began in 1967 and detailed information for hunter kills is available only since that date. The grizzly bear hunting season in the Cabinets ended in 1974.

Distribution of sightings and sign for the 1959-1983 time period is shown in Figure 3. This map applies only to the Kootenai National Forest south of U.S. Highway 2. Two areas of concentration for sightings or sign appear on this map. One is the area in the center of the Cabinet Mountains Wilderness around Snowshoe Peak and the other is in the southerly one-third of the wilderness. Most other records are scattered over the remaining portion of the Kootenai National Forest. Judgments concerning this distribution must consider observer effort or number of persons visiting an area and the observability or the nature of the habitat (e.g. more animal observations may come from open habitat over thickly vegetated habitat). Since 1975, 15 observations of females with young have been reported. Eight of these observations occurred since 1980.

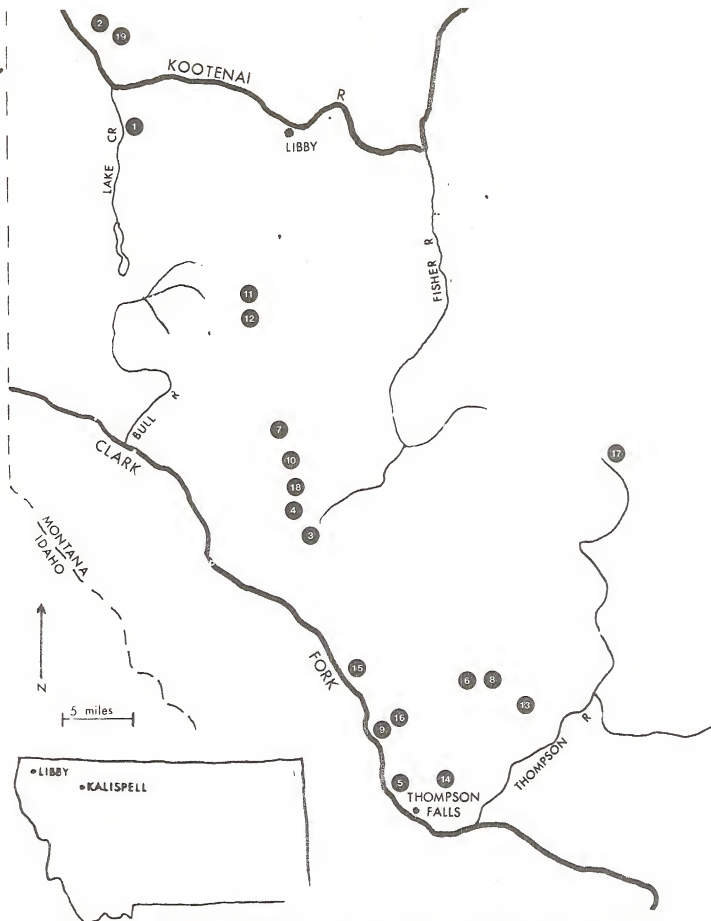


Figure 2. Distribution of known grizzly bear kills in the Cabinet Mountains, 1950-1983 (Numbers refer to Table 1.)

Table 1. Known grizzly bear kills in the Cabinet Mountains, 1950-1983 (some information compiled from Halvorson 1974, Madel 1983, K.R. Greer Pers. Comm.).

Map Number ¹	Date	Location	Sex-Age
1	Spring 1952	Lake Creek	2 Adult Females, 3 Yearling Males and 1 Female
2	Fall 1953	O'Brien Creek	1 Subadult Male
3	Fall 1954	Silverbow Creek	1 Adult Female
4	Fall 1955	Baree Creek	1 Adult Male, 1 Adult Female
5	Fall 1958	Squaw Creek	1 Adult Female
6	Summer 1959	Mt. Headley	Unknown Bear
7	Fall 1959	Rock Lake	1 Adult Female, 1 Cub
8	Fall 1959	W. Fk. Thompson River	1 Adult Female, 3 Cubs
9	Summer 1964	Graves Creek	2 Yearlings
10	Fall 1964	Wanless Lake	3 Subadults (1 Adult wounded)
11	Fall 1965	Snowshoe Lakes	2 Subadults
12	Spring 1968	Bear Creek	1 Adult Female
13	Fall 1969	Priscilla Peak	1 Adult Female
14	Spring 1970	Thompson Falls (?)	Unknown Bear
15	Fall 1970	Cameron Gulch	2 Subadult Males
16	Fall 1970	Squaw Creek	1 Adult Female, 1 Subadult female
17	Fall 1971	Murr Creek	1 Adult Female
18	Fall 1974	Swamp Creek	1 Adult Male
19	Fall 1977	Rabbit Creek	1 Adult Male

1 - Map number refers to Figure 2.

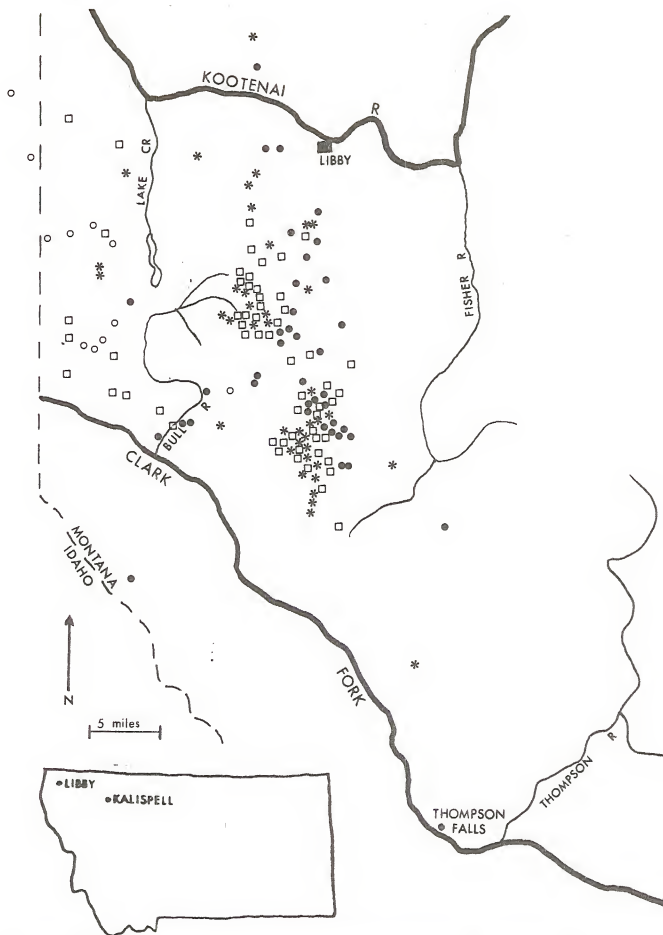


Figure 3. Seasonal distribution of grizzly bear sightings, 1959-1983
 (● = Spring, □ = Summer, * = Fall, ○ = Unknown)

TRAPPING

Trapping began on 4 May and snares were operational for 70 days until 18 July. Effort was concentrated on the eastern side of the main Cabinets, from Deep Creek south to the West Fisher River. Two weeks were spent trapping the western side of the main Cabinets in the Bull River drainage. A total of 40 individual black bears were captured 44 times. A single adult female grizzly (#678) was captured in Bear Creek drainage on 29 June. The grizzly and five black bears were fitted with radio-collars.

Figure 4 shows trap success by time period. During mid and late May, trap success (percent of total snares capturing bears each night) reached a high of approximately 20%. Success was good through the end of June, but declined rapidly in July. Overall trap success was about 12 percent. Due to the number of bears caught, the logistics of trapping, and the time required to make cubbies and reset snare, it was difficult to keep more than 8 - 10 snares operational on a daily basis with one trapping team. Trapping was attempted at higher elevations inside the wilderness during early August, but was abandoned because it was determined to be an inefficient use of time without helicopter support. Pack animals could not be used due to terrain and lack of a trail system. Trapping activities also reduced time available for radio tracking.

Figure 4.

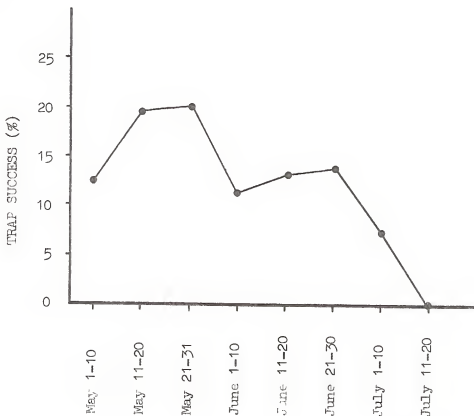


Figure 4. Trap success by time period. Trap success expressed as a percent of operational snares capturing bears each night.

GRIZZLY BEAR TRAPPING AND POPULATION DATA

A female grizzly was captured on 29 June in the Bear Creek drainage. Physical measurements and a scale weight of 86.4 kg were obtained (Table 2). The bear appeared in fair physical condition considering the date of capture. There were no signs of any recent suckling, but the animal was lactating. Visual observations in October, and other evidence from summer locations did not indicate that she was accompanied by cubs or yearlings. A count of cementum annuli from the extracted tooth indicated an age of 28.5 years. One other grizzly did visit and trigger a snare in Libby Creek drainage, but capture was unsuccessful. Hair and track measurements were used to verify this individual as a grizzly.

Several other instances of grizzly bear sign were noted during 1983 (S. Martin and J. Brown, Pers. Comm.), however it is difficult to assign these observations to individual bears. Two of three grizzly track measurements were similar enough to grizzly 678 or the bear that evaded capture in the Libby Creek drainage to preclude classification as separate individuals. One set of track measurements had sufficiently different dimensions to consider the origin as a distinctly different individual. This resulted in a minimum of three known grizzly bears in the central portion of the main Cabinets during 1983.

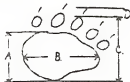
BLACK BEAR TRAPPING AND POPULATION DATA

Forty individual black bears were captured during 1983 (Table 3). Of the total, 29 (73%) were males and 11 (27%) were females. This total was further stratified into samples east and west of the main Cabinet Range (Table 4). These areas fall into different hunting districts with dissimilar hunting seasons. East side sex ratios differed significantly from a 50:50 sex ratio ($p = .002$), while west side samples sizes are somewhat small for comparison. Thier (1981) also trapped the same area on the west side in 1980 (Table 5). Pooling that data with west side ratios from this study produce larger sample sizes and a west side sex ratio that does not differ from a 50:50 ratio ($p=.372$), however east side sex ratios did approach a significant difference from west side ratios (Chi-square=3.42, $p=.064$).

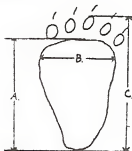
Table 2. Physical measurement of grizzly 678 captured in the Cabinet Mountains, 1983.

Date	6/29/83
Age and Sex ¹	28.5 Female
Weight	86.4 kg (190 lbs.)
Color	Medium brown silvertip, dark leggings, silver face and head
Total body length ²	142.9 cm (56.25 in.)
Neck girth ⁴	55.9 cm (22 in.)
Chest girth ⁴	91.4 cm (36 in.)
Shoulder height ⁵	74.9 cm (29.5 in.)
Shank length ⁶	39.4 cm (15.5 in.)
Foot measurements ⁷	
Front pad width	11.4 cm (4.5 in.)
Front pad length	5.7 cm (2.25 in.)
Front foot length	11.4 cm (4.5 in.)
Front claw length	5.0 cm (2.0 in.)
Front claw arc	7.0 cm (2.75 in.)
Hind pad width	11.4 cm (4.5 in.)
Hind pad length	15.2 cm (6.0 in.)
Hind foot length	19.7 cm (7.75 in.)
Reproductive state	Lactating
Fat index	3
Ear tags	Yellow plastic rototags
Left	678
Right	679
Lip tattoo	678 Black
Collar color	Yellow

- Age was determined by the number of cementum annuli rings in extracted tooth.
- Total body length indicates length from tip of nose to base of tail, following natural body contours.
- Neck size measured at smallest circumference of neck.
- Chest girth measurement around the body just posterior to the shoulders.
- Shoulder height is the distance from heel of front foot to midline between shoulders.
- Shank length is the distance from the knee to the heel of the hind foot.
- Foot measurements:
 - Front pad length
 - Front pad width
 - Front foot length
 - Front claw length



-
- A. Hind pad length
B. Hind pad width
C. Hind foot length



8. Front claw outside arc is measured from base of claw to tip over contour.
9. Fat index is an arbitrary measure of the bear's condition on a scale of 1 to 5; 1 being emaciated, 3 being average, and 5 being extremely fat.
-

Table 3. Capture dates, sex, age, ear tag, weight, location, and color of black bears captured in the Cabinet Mountains during 1983.

Capture Date	Sex	Age ¹	Ear Tag ² Color	Number	Weight ³	Location ⁴	Hide Color
5/6/83	F	4(e)	Red	84-85	59.1(a)	W. Fisher (E)	Brown
5/7/83	M	15	Red	86-87	104.5(a)	W. Fisher (E)	Brown
5/11/83	M	5	Red	88-89	84.1(a)	Ramsey Cr. (E)	Brown
5/13/83	M	12	Red	90-91	131.8(a)	Deep Cr. (E)	Black
5/15/83	F	7	Red	92-93	54.5(a)	Bramlet Cr. (E)	Black
5/15/83	M	7(e)	Red	94-95	104.5(a)	W. Fisher (E)	Brown
5/16/83	M	2	Red	96-97	40.9(a)	Ramsey Cr. (E)	Black
5/16/83	M	13	Red	98-351	104.6(e)	Deep Cr. (E)	Black
5/18/83	F	4	Red	352-353	47.7(a)	W. Fisher (E)	Brown
5/19/83	F	2	Red	354-355	31.8(a)	Bramlet Cr. (E)	Black
5/19/83	F	6	Red	356-357	54.5(a)	W. Fisher (E)	Black
5/20/83	M	6	Red	358-359	79.5(a)	Bear Cr. (E)	Brown
5/21/83	M	2	Red	360-361	59.1(a)	Snowshoe Cr. (E)	Black
5/23/83	M	7(e)	Red	261-262	95.8(e)	Snowshoe Cr. (E)	Black
5/23/83	M	10	Red	263-264	113.6(a)	Bear Cr. (E)	Brown
5/25/83	F	3	Red	362-363	40.9(a)	Bull R. (W)	Brown
5/28/83	M	4	Red	364-365	65.9(a)	Bull R. (W)	Brown
5/29/83	M	10	Red	366-367	104.7(e)	Snake Cr. (W)	Black
5/29/83	M	3	Red	368-369	37.9(e)	S. Fk. Bull R. (W)	Black
5/29/83	M	3	Red	370-371	48.3(e)	Bull R. (W)	Brown
6/2/83	M	8	Red	265-266	100.1(e)	Bear Cr. (E)	Brown
6/2/83	F	3	Red	372-373	50.0(a)	S. Fk. Bull R. (W)	Brown
6/3/83	M	5	Red	374-375	56.8(a)	S. Fk. Bull R. (W)	Black
6/4/83	F	3	Red	272-273	38.6(a)	E. Fk. Bull R. (W)	Brown
6/4/83	M	4	Red	267-268	52.3(a)	Libby Cr. (E)	Black
6/5/83	M	9	Red	269-270	88.8(e)	Cable Cr. (E)	Brown
6/7/83	M	6	Red	274-275	64.7(e)	Standard Cr. (E)	Black
6/10/83	M	5	Red	14-15	59.1(a)	W. Fisher (E)	Black
6/15/83	M	7	Red	257-258	100.0(a)	Libby Cr. (E)	Black
6/16/83	M	5	Red	259-260	55.6(e)	W. Fisher (E)	Black
6/17/83	M	12	Red	253-254	100.6(e)	Libby Cr. (E)	Black
6/17/83	F	6	Red	255-256	44.4(e)	Libby Cr. (E)	Brown
6/21/83	M	8	Red	651-652	98.7(e)	Bear Cr. (E)	Black
6/23/83	M	1	Red	653-654	10.5(e)	Libby Cr. (E)	Brown
				663-664	(tag mdx-up)		
6/23/83	M	4	Red	655-656	54.5(a)	Bear Cr. (E)	Black
6/24/83	M	6	Red	657-658	94.9(e)	Bear Cr. (E)	Black
6/27/83	M	2	Red	659-660	28.8(e)	Libby Cr. (E)	Black
6/29/83	F	11	Red	661-662	21.1(e)	Ramsey Cr. (E)	Black
7/4/83	F	5	Red	665-666	23.7(e)	Ramsey Cr. (E)	Black
7/4/83	M	6	Red	667-668	70.4(e)	Ramsey Cr. (E)	Brown

1 Age determined by lab examination of extracted tooth (e - estimate).

2 All ear tags were plastic rototags.

3 Weight in kilograms (a - actual, e - estimate from regression based on chest girth and length).

4 E - East side of Cabinet Mountains, W - West side of Cabinet Mountains.

Classification of males and females by coat color is shown in Table 4. The trapped sample was stratified into east and west segments and west side data was pooled with Thier's (1981) trapped sample (Table 5). East side proportions of males and females classified by coat color did not differ (Chi-square = 0.0, $p=1.0$), while west side proportions did differ significantly (Chi-square = 4.64, $p = .033$). Color proportions of males on the east side study area did not appear significantly different from west side proportions (Chi-square = .01, $p = .915$), but proportions of females classified by coat color did approach significance (Chi-square = 3.26, $p = .071$). This could indicate a higher proportion of brown phase female black bears on the west side study area over the east side study area.

Table 4. Numbers of captured male and female black bears classified by coat color on two study areas in the Cabinet Mountains during 1983.

<u>East Side</u>		<u>Black</u>	<u>Brown</u>	<u>Total</u>
Male	-	15	9	24
Female	-	5	3	8
Total	-	20	12	32

<u>West Side</u>		<u>Black</u>	<u>Brown</u>	<u>Total</u>
Male	-	3	2	5
Female	-	0	3	3
Total	-	3	5	8

Table 5. Numbers of captured male and female black bears classified by coat color from the west side of the Cabinet Mountains during 1980 (Thier 1981).

		<u>Black</u>	<u>Brown</u>	<u>Total</u>
Male	-	6	3	9
Female	-	3	7	10
Total	-	9	10	19

Seven adult females were captured during the trapping season. Two of these were lactating, but no cubs were observed at the trap site. Subsequent observations of one captured female that was lactating did not indicate she was accompanied by cubs. One other female was judged to be in estrous at capture. Interpretation of this capture data might indicate poor reproduction for 1983.

Helicopter surveys of upper elevation shrubfields were conducted by MDFWP personnel between 30 August and 22 September of 1983 to observe and classify black and grizzly bears (Brown et al. In Press). Inclement weather prolonged the survey, but the observer felt that very few duplicate observations occurred. Survey periods were early morning and late evening to correspond with bear activity. No grizzlies were seen, but a total of 250 black bears were observed over approximately 810 km² of prime habitat in the main and west Cabinets (Table 6). Of this total, 14.4% were females with cubs. Mean litter size was calculated to be 1.6 cubs/female. This data would indicate good black bear reproduction in the Cabinets during 1983.

Table 6. Numbers of black bears observed during fall helicopter shrubfield surveys in the Cabinet Mountains during 1983 (Brown et al., Unpub. P-R Job Prog. Rept., W-130-R-15, In Press).

Females with Cubs	Cubs	Adults	Subadults	Total
36 (14.4%)	59 (23.6%)	131 (52.4%)	24 (9.6%)	250

Age structure information (Table 3) was stratified into east and west study area samples. Subadults were defined as black bears less than four years old (Jonkel and Cowan 1971). The adult/subadult proportion for the east side study area was 3.57 (N=32). The west side adult/subadult proportion was 0.6, but sample size was small (N = 8). Thier (1981) trapped the west side area in 1980. The adult/subadult proportion from that sample was 2.17 (N = 19). The west side adult/subadult proportion from this study does not differ significantly from Thier's sample (Chi-square = 2.23, p = .152). Pooling age data from the west side study area results in an adult/subadult ratio of 1.25 (N = 27). For black bear in Idaho, Beecham (1980) reported adult/subadult proportions of 1.14 and 2.45 for heavily and lightly hunted areas respectively.

Several older age males were captured on the east side study area. Thirty-four percent of the east side trapped sample consisted of seven year-old or greater male black bears. The pooled sample from the west side contained only 15% males in the same age category, though this difference was not significant (Chi-squared = 2.95, p = .091).

Twelve of the captured males had estimated weights of 91 kg or greater. Two males had scale weights of 114 kg or greater. Scale weights were obtained from 22 captured bears ranging from 32 kg to 132 kg. A weight regression based on chest girth and total body length was generated similar to McLellan's (1982) regression for grizzly bears. The regression is as follows:

$$W = .0000729 LG^2$$

W - predicated weight (kg) $R^2 = .991$
 L - total body length (cm) $P = .001$
 G - chest girth (cm)

The same regression expressed in the English system:

$$W = .002629 LG^2$$

W - predicated weight (lb)
 L - total body length (in)
 G - chest girth (in)

Many researchers report using livestock weight tapes (WE-80) for estimates of black and grizzly bear weights (McLellan and Jonkel 1980, Schallenberger and Jonkel 1980, Servheen 1981, Thier 1981, Aune and Stivers 1983). A comparison of cattle weight tape estimates with scale weights in this sample of 22 black bears revealed that weight tape estimates averaged only 64.1% (S.D = 9.3) of actual scale weights. Drug dosages based only on weight tape estimates could therefore be only two-thirds of recommended levels. In the instance of the captured grizzly, this regression appears more accurate than McLellan's (1982).

Home Range and Movements

Grizzly Bear

Summer and fall home range for grizzly 678 during 1983 is shown in Figure 5. Due to the late date of capture (29 June), no spring location data was plotted and this home range should be considered partial at best. Summer locations were few due to continued efforts to trap additional grizzlies and the lack of local aircraft for relocation flights. Calculation of home range size resulted in a minimum home range of 429.9 km² and a modified minimum home range of 102.3 km². Distance between extreme points in the home range was 63.2 km. Twenty-eight specific radio locations were used to plot the home range. Nine of these were from summer and 19 were fall locations. Seven general locations were also obtained, but were not used in home range calculations.

Minimum home range locations for adult female grizzlies in the Northern Continental Divide Grizzly Bear Ecosystem (NCDGBE) vary from 75-509 km² (Rockwell et al. 1978, Schallenberger and Jonkel 1980, McLellan 1982, Aune and Stivers 1982 and 1983, Servheen 1983). Minimum home ranges for adult females in the Yellowstone Grizzly Bear Ecosystem (YGBE) vary from 75-831 km² (Knight et al. 1980).

Summer radio locations were all within a 5 km radius of the capture site. In mid-August grizzly 678 moved 41 km to the Vermilion River drainage. It is not known how fast this distance was covered nor the route taken, but it probably took less than eight days. This was estimated because a radio location flight on 22 August failed to locate the animal, but this flight did not cover the Vermilion area and it was assumed that grizzly 678 was in that vicinity. A flight on 29 August located grizzly 678 south of the

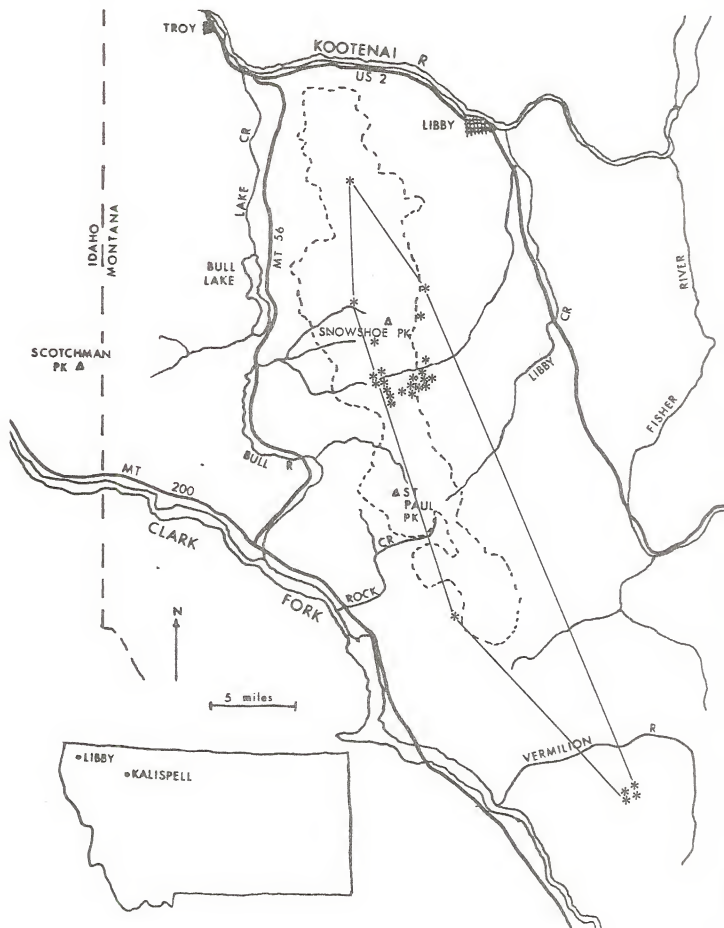


Figure 5. Minimum home range of grizzly bear 678 in the Cabinet Mountains during 1983.

Vermilion River. Subsequent radio locations and two sessions of 24 hour monitoring indicated that a relatively small area in and around a large clearcut was being heavily used. Grizzly 678 left this area on 6 or 7 September. A general radio location on 8 September indicated the bear was on the divide between the Vermillion and Silver Butte Fisher River drainages. A specific location on 13 September indicated the bear was in the McKay Creek drainage and on 16 September it was back in Bear Creek drainage. This movement back to Bear Creek drainage from the Vermillion drainage took about nine or ten days and appeared to be along the main ridge system of the Cabinets. During the remainder of the fall, grizzly 678 moved through the north central portion of the Cabinets and at one point was within 11 km (7 mi) of U.S. Highway 2. Though only three other locations were obtained on the western side of the main Cabinets, the bear did den in the upper Bull River drainage. Time of denning was difficult to verify due to adverse weather hampering radio location flights, however it is my judgment that the bear denned between 10 and 20 November.

Black Bear

Five black bears (four males and one female) were fitted with radio collars and tracked until denning. Few radio locations on black bears during spring and summer were obtained due to continued efforts to trap and locate additional grizzlies and the lack of available aircraft for radio location flights. During the fall, a pilot was contracted and regular locations were obtained.

On the basis of radio locations, bears trapped on either side of the main Cabinets tended to remain on that side and not cross the main divide (Fig. 6-7). Bear 264 was a minor exception to this trend since it denned along the divide, but opposite of the trap location. Minimum home range sizes are shown in Table 7. The female (Bear 84) had the smallest home range (6.7 km²). Bear 90 had the largest home range (126.1 km²), but this was substantially larger than the other three males. Average home range size for males was 47.3 km². Amstrup and Beecham (1976) reported adult female minimum home ranges of 16.6 - 130.3 km² and adult male minimum home ranges of 109-115 km² for black bears in west-central Idaho. From southcentral Montana, Rosgaard and Simmons (1982) found minimum home ranges of 6.5-35.2 km² for adult female and 92-216 km² for adult male black bears. Aune and Stivers (1982 and 1983) reported minimum home ranges of 23.5-82.4 km² for adult females and 94.3-391.6 km² for adult males in northcentral Montana.

Table 7. Home range sizes of radio-collared black bears in the Cabinet Mountains during 1983.

Number	Sex	Age	Minimum Home Range	
			km ²	mi ²
84	F	4	6.7	2.6
88	M	5	16.8	6.5
90	M	12	126.1	48.7
264	M	10	21.5	8.3
766	M	10	24.9	9.6

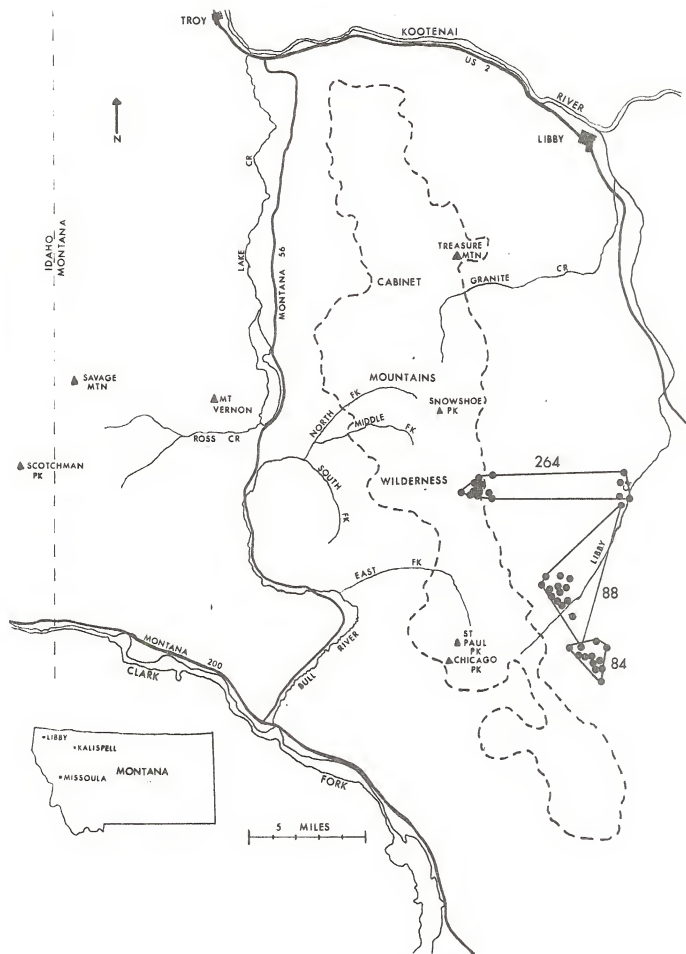


Figure 6. Minimum home ranges of radio collared black bear in the Cabinet Mountains during 1983.

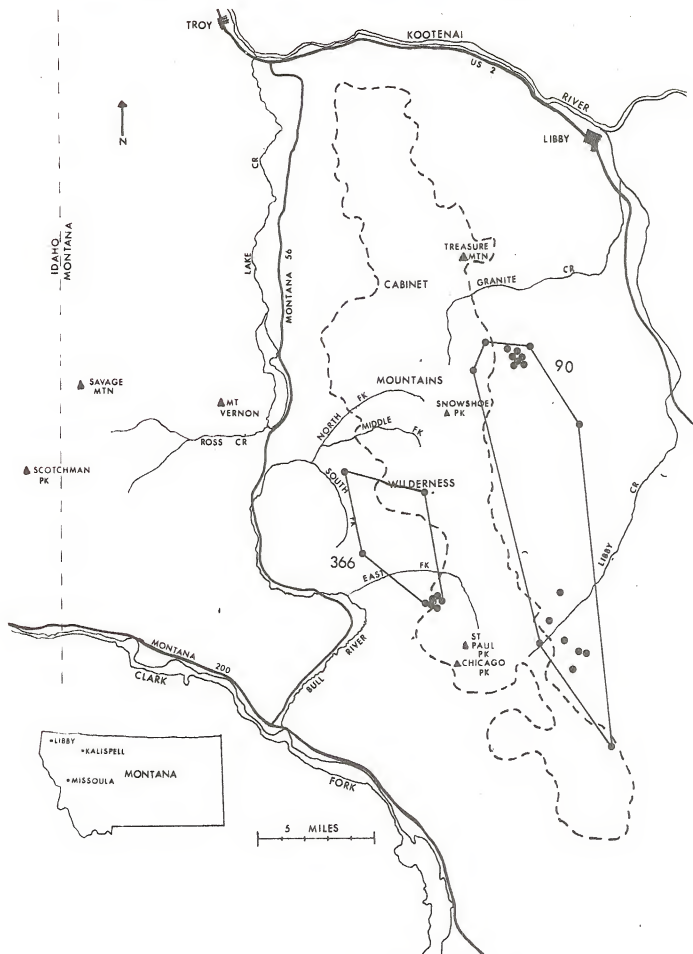


Figure 7. Minimum home ranges of radio collared black bears in the Cabinet Mountains during 1983.

Radio-collared black bears showed signs of denning activity during early October. By mid-October, three of five radio-collared bears had denned and by the end of October all five were denned. Time of denning during 1983 appeared earlier than dates reported by Amstrup and Beecham (1976) or Aune and Stivers (1983) and similar to dates reported by Jonkel and Cowan (1971) west of Glacier Park.

Habitat Characteristics

Grizzly Bear

Summer radio locations were concentrated within 5 km (3 mi) of the capture site. Though grizzly 678 was captured on 29 June and located on 30 June, for purposes of this report those two locations were treated as summer (July 1 - August 15) locations. Average elevation of summer radio locations was 1558 m (SD = 226, N = 9) with a range of 1232 m to 1915 m. Average elevation of fall radio locations was 1580 m (SD = 234, N = 19) with a range of 1128 m to 1890 m. Classification of radio locations by aspect (Fig. 8) shows a shift from use of southerly aspects in summer to use of more northerly aspects in fall. Comparisons of percent slope at radio locations show little difference in the means between summer ($x = 49\%$, SD = 14, N = 9) and fall ($x = 46\%$, SD = 17, N = 19).

Highest proportions of summer and fall radio locations were in mixed shrubfield snowchutes, timbered shrubfields, and mixed shrubfield cutting unit habitat components (Table 8). Radio locations were also classified by habitat type (Table 9). Habitat types with the greatest proportions of radio locations for summer and fall were Abies lasiocarpa-Menziesia

Table 8. Summer and fall percentages of grizzly bear radio locations in various habitat components.

<u>Habitat Component</u>	<u>Summer (N=9)</u>	<u>Fall(N=19)</u>
Closed Timber	0	5
Timbered Shrubfield	33	37
Riparian Streambottom	0	5
Mixed Shrubfield Snowchute	56	21
Mixed Shrubfield Cutting Unit	0	16
Huckleberry Shrubfield	0	5
Drainage Forbfield	11	0
Beargrass Sidehill Park	0	11

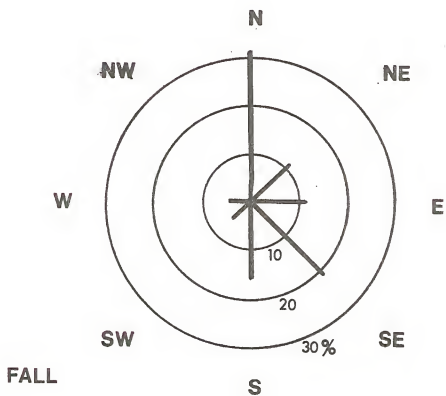
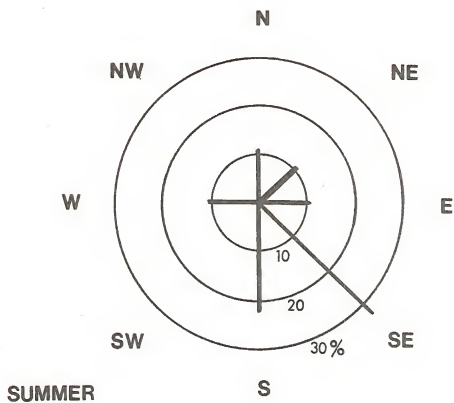


Figure 8. Percentages of grizzly bear radio locations classified by various aspect categories.

Table 9. Summer and fall percentages of grizzly bear radio locations in various habitat types.

<u>Habitat Type</u>	<u>Summer (N=9)</u>	<u>Fall (N=19)</u>
<u>Thuja plicata</u> / <u>Oplopanax horridum</u>	0	5
<u>Tsuga heterophylla</u> / <u>Clintonia uniflora</u> <u>Aralia nudicaulis</u> phase	0	11
<u>Abies lasiocarpa</u> / <u>Clintonia uniflora</u> <u>Clintonia uniflora</u> phase	11	0
<u>Abies lasiocarpa</u> / <u>Clintonia uniflora</u> <u>Aralia nudicaulis</u> phase	22	5
<u>Abies lasiocarpa</u> / <u>Menziesia ferruginea</u>	44	37
<u>Tsuga mertensiana</u> / <u>Menziesia ferruginea</u>	0	5
<u>Abies lasiocarpa</u> / <u>Xerophyllum tenax</u> <u>Vaccinium globulare</u> phase	22	16
<u>Abies lasiocarpa</u> / <u>Xerophyllum tenax</u> <u>Vaccinium scoparium</u> phase	0	21

ferruginea and Abies lasiocarpa-Xerophyllum tenax. Habitat types by definition do not always present a clear picture of likely habitat use. Though use may occur within a given type, radio locations were often at sites in early successional stages (e.g. mixed shrubfield snowchute and mixed shrubfield cutting unit). Proportions of radio locations in specified landtypes are shown in Table 10. Landtypes are based upon soils, vegetation, and landform. Landtype 401 (trough walls) had the highest percentages of summer and fall radio locations (44% and 37% respectively). Grizzly 678 also denned within landtype 401 at about 1890 m in a beargrass sidehill park/slabrock complex habitat component.

Table 10. Summer and fall percentages of grizzly bear radio locations in various landtypes.

<u>Landtype</u>	<u>Summer (N=9)</u>	<u>Fall (N=19)</u>
401 - Trough Walls	44	37
403 - Alpine Ridges, Steep Headwalls, and Cirque Basins	11	0
404 - Alpine Basins and Straight to Convex Alpine Slopes	0	16
405 - Residual Soil and Rock Outcrop Complex	33	11
406 - Glacial Till, Residual Soil, and Rock Outcrop Complex	11	16
407 - Glacial Till (Alpine Valley Train)	0	16
500 - Residual Soil	0	5

Much of the area used by grizzly 678 during summer is unroaded and has no maintained trails in the vicinity. This area is presently managed by the U.S. Forest Service under semi-primitive non-motorized or wilderness designation. When grizzly 678 moved to the Vermilion River drainage in late August, she spent approximately $2\frac{1}{2}$ weeks in the vicinity of a large (1.2 km^2) clearcut harvested during 1959-1962. Post-logging treatment consisted of broadcast burning during September of 1963. Huckleberry production on this particular clearcut during 1983 was judged to be excellent. The timber harvest prescription in this instance apparently produced an attractive area for bears. Several black bears and black bear beds were noted in the vicinity of this cut. It was also interesting that grizzly 678 used a "leave strip" of timber in the middle of the cut for a daybed on several occasions. The clearcut was also inside a road closure area which likely provided sufficient security for the bear even though a small scale timber harvest operation was occurring as close as 2.4 km. Although this cut occurred prior to the development of timber harvest guidelines for grizzly bear (Ruediger and Mealey 1978, Zager 1980), use of this particular cut, the "leave strip", and the road closure area provide supporting evidence for the possible value of certain timber management practices to improve habitat when properly implemented with wildlife concerns addressed.

Black Bear

Average elevation of radio locations of five monitored black bears increased from a mean of 1386 m (SD = 196, N = 15) during summer to a mean of 1485 m (SD = 268, N = 56) during falls. Elevations of summer radio locations ranged from 1140 m to 1704 m and fall locations ranged from 970 m to 1956 m. Radio locations appeared to shift from southerly aspects in summer to northerly aspects in fall (Fig. 9). Classification of radio locations by percent slope showed little difference between summer ($\bar{X}$ = 44%, SD = 24, N = 15) and fall ($\bar{X}$ = 43%, SD = 20, N = 56).

Closed timber, open timber and alder shrubfield/drainage forbfield complexes were the most heavily used habitat components during summer (Table 11). During fall, high proportions of locations persisted in closed and open timber, but an increase in locations in the timbered shrubfield component were noted. Habitat types with highest proportions of radio locations during summer and fall were Tsuga heterophylla/Clintonia uniflora, Abies lasiocarpa/Menziesia ferruginea, and Abies lasiocarpa/Xerophyllum tenax (Table 12). Landtype classification of radio locations (Table 13) showed high use of landtype 401 (trough walls) during summer and fall (27% and 25% respectively). Table 14 shows habitat parameters at den sites of radio collared black bears. Elevations ranged from 1296 m to 1956 m. Slope aspect, and habitat component were variable, but three of five dens were in landtype 401.

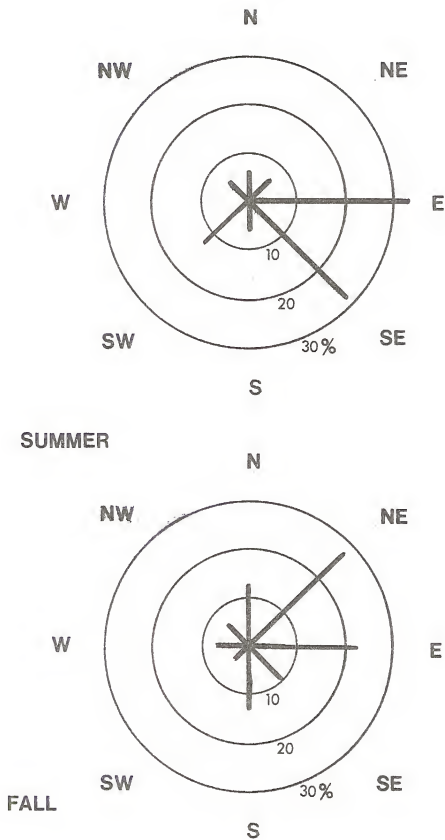


Figure 9. Percentages of black bear radio locations classified by various aspect categories.

Table 11. Summer and fall percentages of black bear radio locations in various habitat components.

<u>Habitat Component</u>	<u>Summer (N=15)</u>	<u>Fall (N=56)</u>
Closed Timber	20	20
Open Timber	27	18
Timbered Shrubfield	13	23
Timbered Shrubfield/Mixed Shrubfield Snowhute Complex	0	2
Riparian Streambottom	0	7
Riparian Streambottom/Mixed Shrubfield Snowhute Complex	0	4
Mixed Shrubfield Snowhute	7	4
Mixed Shrubfield Cutting Unit	13	5
Alder Shrubfield/Drainage Forbfield Complex	20	5
Huckleberry Shrubfield/Beargrass Sidehill Park Complex	0	4
Graminoid Sidehill Park/Beargrass Sidehill Park Complex	0	5
Beargrass Sidehill Park	0	4

Table 12. Summer and fall percentages of black bear radio locations in various habitat types.

<u>Habitat Type</u>	<u>Summer (N=15)</u>	<u>Fall (N=56)</u>
<u>Tsuga heterophylla/Clintonia uniflora</u> <u>Clintonia uniflora</u> phase	60	29
<u>Tsuga heterophylla/Clintonia uniflora</u> <u>Aralia nudicaulis</u> phase	0	7
<u>Abies lasiocarpa/Menziesia ferruginea</u>	27	16
<u>Tsuga mertensiana/Menziesia ferruginea</u>	0	7
<u>Tsuga mertensiana/Xerophyllum tenax</u>	0	9
<u>Abies lasiocarpa/Xerophyllum tenax</u> <u>Vaccinium globulare</u> phase	13	29
<u>Abies lasiocarpa/Xerophyllum tenax</u> <u>Vaccinium scoparium</u> phase	0	4

Table 13. Summer and fall percentages of black bear radio locations in various landtypes.

<u>Landtype</u>	<u>Summer (N=15)</u>	<u>Fall (N=56)</u>
108 - Lacustrine and Alluvial Terraces	0	2
322 - Low Relief Rolling Foothills	13	7
352 - Glacial Till (Depositional)	13	4
355 - Glacial Till (Secured Rockland Complex)	13	4
401 - Trough Walls	27	25
403 - Alpine Ridges, Steep Headwalls, and Cirque Basins	0	7
404 - Alpine Basins and Straight to Convex Alpine Slopes	0	14
405 - Residual Soil and Rock Outcrop Complex	20	14
406 - Glacial Till, Residual Soil, and Rock Outcrop Complex	0	7
407 - Glacial Till (Alpine Valley Train)	7	5
408 - Steep Valley Sideslopes and Truncated Spurs	7	11

Table 14. Habitat parameters from den sites of radio collared black bears in the Cabinet Mountains during 1983.

<u>Bear</u>	<u>Sex</u>	<u>Elevation</u>	<u>Aspect</u>	<u>Slope</u>	<u>Component</u>	<u>Landtype</u>
84	F	1296 m	160°	80%	Timbered Shrubfield	401
88	M	1668 m	30°	40%	Open Timber	405
90	M	1308 m	350°	50%	Closed Timber	401
264	M	1956 m	210°	80%	Beargrass Sidehill Park	401
366	M	1692 m	60°	60%	Timbered Shrubfield/ Mixed Shrubfield Snowhute Complex	403

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Appendix Table 15. Long term average temperature and precipitation data from Libby Ranger Station (U.S. Dept. of Comm. 1981).

<u>Month</u>	<u>Average Temperature</u>		<u>Average Precipitation</u>	
	<u>C°</u>	<u>F°</u>	<u>cm</u>	<u>in</u>
January	-5.3	22.4	6.15	2.42
February	-1.1	30.1	3.94	1.55
March	2.1	35.7	3.18	1.25
April	7.4	45.3	2.84	1.12
May	12.2	54.0	3.99	1.57
June	15.7	60.3	4.67	1.84
July	19.4	67.0	1.73	.68
August	18.5	65.3	2.67	1.05
September	13.8	56.8	3.25	1.28
October	7.5	45.5	4.88	1.92
November	.7	33.2	6.02	2.37
December	-3.5	25.7	5.97	2.35
Annual	7.3	45.1	49.28	19.40

Appendix Table 16. Description of habitat components. Excerpted from Madel (1982).

I. Closed timber

Closed canopy timber are those sites with tree cover greater than 60 percent, and a variable but often sparse understory. Vegetation structure and composition are highly variable as influenced by environmental conditions of a site. The tree stratum consists primarily of conifers, except for occasional quaking aspen stands (Populus tremuloides). Common forest habitat types and phases that constitute closed timber specifically in the Cabinet range are included in Appendix I. Old growth forests of western red cedar and western hemlock typically occur in the valley bottoms. Various forest communities of western hemlock, grand fir, Douglas fir, larch and western white pine grow along a broad mid-elevational gradient. Subalpine fir and mountain hemlock makeup the upper elevation closed timber types.

II. Open timber

This component includes open timbered sites with tree canopy cover 30 to 60 percent, and a sparse grass-forb understory. Coniferous tree species dominate the overstory. This is a relatively uncommon forest community in the main Cabinets and often exists as habitat type inclusions in closed timber. Open timber is commonly found on dry exposures, limiting undergrowth to few rhizomatous species. Related habitat types include Douglas fir/pine grass, grand fir/beargrass, and the whitebark pine/subalpine fir.

III. Timbered shrubfield

These are open canopy timbered sites with tree cover 30 to 60 percent, and a shrub dominated understory. Vegetation composition and structure again is variable, but contingent on top-edaphic conditions of the site. The overstory consists of conifers and except for more xeric aspects, the shrub stratum is well developed. The forb layer is characteristically sparse due to limited light penetration through the tree and shrub canopies. Timbered shrubfields are extensive in the Cabinet Range and occur within the same elevational range as closed timber, although most prevalent in the subalpine zone. Component sites commonly delineated are associated with two major habitat types, subalpine fir/beargrass/huckleberry and subalpine fir/menziesia, both of which under favorable environmental conditions produce a number of key fruiting shrub species. Subalpine fir/beargrass/huckleberry generally occupies ridgetops and downslope extensions on southerly aspects. The shrub canopy is low and scattered, consisting primarily of globe huckleberry (Vaccinium globulare) and grouse whortleberry (Vaccinium scoparium). Beargrass (Xerophyllum tenax) and elk sedge (Carex geyi) compose the graminoid-forb layer as either a dense mat or sparse clumps. Subalpine fir/menziesia is an extremely widespread upper elevation habitat type in the Cabinets on all aspects. Merging with Subalpine fir/beargrass/huckleberry on warmer slopes. Huckleberry and mountain ash (Sorbus scopulina) canopy coverage is variable, but often suppressed by more vigorous shrubs, especially

menziesia. Many productive timbered shrubfields at higher elevations are the result of selective regeneration cuts and occasionally shelterwood or thinning systems where solid scarification is minimal. When ground mapping, subjective decisions are made on whether or not a timbered shrubfield site classifies as a foraging component. Generally if important fruiting shrub species occupy 40 percent or more of the total shrub canopy it's identified as such and mapped. At lower elevations in the Douglas fir, grand fir, and western hemlock series, buffalo berry (Shepherdia canadensis) and serviceberry (Amelanchier alnifolia), two key bear food shrub species, occur separately in certain areas. Buffalo berry is common on the east side the the Cabinets predominating in moist timbered stands, while serviceberry occurs as a scattered shrub layer on dry benches and gradual slopes underneath a partial canopy.

VI. Shrubfields

As a general class, shrubfields are shrub dominated sites with a sparse tree cover of 30 percent or less. It's the most widespread nonforested habitat component occurring in the Cabinet Range. Species composition and vegetation structure are extremely variable, creating a number of diverse shrub communities. Shrubfields alternately produce an abundance of key bear foods throughout the growing season, which documented grizzly sign and observations have correlated. Because of its importance as a foraging component, shrubfields have been separated into three distinct shrubfield types: Mixed shrubfields, which are further identified by site history; alder (Alnus) shrubfields; huckleberry (Vaccinium shrubfields). Shrubfield types and subtypes are treated and mapped as separate habitat components.

A. Mixed Shrub-Species Shrubfields

Includes shrubfields with a co-dominant shrub stratum and graminoid-forb understory. Top-edaphic conditions and habitat disturbance patterns and site influence shrubfield composition. Mixed shrubfields are long-lived seral communities and are the result of avalanches, wildfires, slope seepage, or various timber harvest prescriptions.

1. Mixed Shrubfield/Snowchute: These are shrub dominated communities resulting from, and often maintained, by sudden snow slides on steep timbered drainages, frequently originating on open slabrock areas and running downslope to the creek bottoms. These sites exist as narrow-linear openings in the forest canopy, or as extensive, broad chutes covering an entire mid-montane slope.

Shrubfield/snowchute communities are vertically stratified, with a tall deciduous shrub canopy (2-3 meters), an understory shrub stratum (2 meters or less), and a variable layer of forbs and perennial graminoids. Dominant woody associates in the high shrub strata include mountain maple (Acer glabrum), alder (Alnus sinuata), mountain ash, and willow (Salix spp.) each species more prevalent on certain sites than others. Lower shrubs are

thimbleberry (Rubus parviflorus), elderberry (Sambucus racemosa), and snowberry (Symphoricarpos albus). The stems of maple, alder, and ash lie prostrate at the base with the lower limbs directed downslope, the tips springing erect after heavy snow cover melts in the spring (Daubenmire 1968). This morphological adaption allows tall shrubs to survive occasional heavy snow slides, while regenerating conifers are lost in avalanche paths. The herbaceous layer is often well developed and abundant in key bear foods, particularly in the lower portions of snowchutes that occur in the more mesic western hemlock/beadlily, subalpine fir/beadlily and subalpine fir/menziesia habitat types. Phenological development of grasses and forbs is relatively early in south facing aspects prior to and during the leafing out of shrubs. Forbs continue to emerge and grow through the summer months on cooler slopes and in many small canopy openings. The more common forbs include lady fern (Athyrium filix-femina), bracken fern (Pteridium aquilinum), glacier lily (Erythronium grandiflorum), spring beauty (Claytonia lanceolata), starry Solomon's seal (Smilacina stellata), twisted stalk (Streptopus amplexifolius), false hellebore (Veratrum viride), meadow rue (Thalictrum occidentale), angelica (Angelica dawsonii), and cow parsnip (Heracleum lanatum).

2. Mixed Shrubfield/Cutting Unit: These are open sites which have been harvested and are currently dominated by a shrub canopy. Community structure and composition is highly variable depending on timber harvest method, site treatment, habitat type-topographic position, and time span since site disturbance. A large portion of the harvested sites along the east face of the main Cabinet Range occur in the western hemlock/beadlily habitat type, a relatively closed-timber zone low in bear foods productivity. The understory vegetation prior to tree canopy removal either has few existing bear foods or is altogether depauperate, providing only a minor rhizome-root stock from which key fruiting shrubs and forbs can resprout. Clearcuts in the western hemlock types and other sites that have been moderately scarified are quickly invaded by opportunistic species through seed dispersal or seeds retained in the soil-duff. Alder, red raspberry (Rubus idaeus), thimbleberry (Rubus parviflorus), sticky currant (Ribes viscosissimum), elderberry, and ceanothus (Ceanothus spp.) are common shrubs growing in disturbed units. Black cottonwood seedlings (Populus trichocarpa) are common in low to mid-elevation clearcuts. Associated opportunistic forbs include fireweed (Epilobium angustifolium), pearly everlasting (Anaphalis margariticae), goldenrod (Solidago spp.), and aster (Aster spp.). On severely scarified soils, graminoids may be one of the few plant groups to occur in abundance for a number of years following disturbance.

Harvested units not scarified and/or those that have been broadcast burned often regenerate with a more vigorous shrub canopy composed of species typically found in adjacent undisturbed timbered stands. Key fruiting shrub species that vegetatively reproduce, resprout quickly from rhizomes or root

crowns and often dominate the shrub stratum for a number of years following timber harvest. Shrub response is most conspicuous in the forested subalpine fir zone. In the lower, mesic subalpine fir/beadlily and menziesia habitat types, unscarified clearcuts develop a dense mixture of shrubs including mountain ash, globe huckleberry, menziesia, thimbleberry, Utah honeysuckle (*Lonicera utahensis*), and willow (*Salix* spp.). Units that have been burned in the upper subalpine fir/beargrass h.t. on south to west aspects are dominated by *Vaccinium* spp., and are mapped as huckleberry shrubfields (See component definition). Zager (1980) provides an excellent correlation between various post harvest treatments and vegetation response in relationship to grizzly bear foods.

3. Mixed Shrubfield/Burn: These are mixed shrubfield communities that have developed following wildfire. Burns in general are uncommon in the Cabinet Mountains due to effective fire suppression during the past 40-70 years. Where mixed shrubfield/burns do occur they are restricted to xeric sites, especially steep southern exposures, which were originally ignited by lightning and then burned off quickly. Small spot burns are evident at the mouths of a number of drainages along the east face of the Cabinets. The entire south side of Berray Mountain, located above the East Fork Bull River exit, occupies one of the largest recent shrubfield burns. Certain sites have been noted as being environmentally positioned in fire prone areas, and the resulting seral shrubfields are maintained in a productive state.

The shrub stratum is 1.5 to 2.5 m in height and horizontally scattered, with exposed rocky shelves and a sparse bunchgrass understory. Serviceberry, willow, mountain maple, and mountain ash are the dominate shrub species on these burned sites. Unfortunately, a majority of the existing mixed shrubfield/burns are in a decadent condition, with minimal annual berry crops. Recent burns show invigorated shrub growth and produce large quantities of serviceberry, ash, and occasionally huckleberry fruit (Refer to Huckleberry shrubfield pp 10), which grizzlies feed on extensively in the late summer and fall. These shrubfields are also of high value to bears because they are often isolated from human disturbance, and provide an irregular timbered edge for efficient food/cover utilization.

B. Alder Shrubfield

This is a tall shrub community dominated by alder, almost to the exclusion of all other shrub species. It may develop as a result of snow movement, wildfire, or timber harvest but is often restricted to mesic sites, especially in seepage areas on steep slopes with shallow rocky soils. Alder shrubfields are maintained in this seral condition for many years by the repeated disturbance of snowslides and intense competition from high shrubs and forbs. This component is locally abundant in the West Cabinets in the lower subalpine fir zone, while in the East Cabinet Range its restricted to higher elevations and typically

associated with drainage forbfields at the base of cirque headwalls.

The shrub stratum is composed of a dominant vertical alder layer, averaging 4 m in height, and a herbaceous understory. Individual shrubs sprout numerous stems making stands extremely dense and almost impenetrable. Utah honeysuckle, mountain ash, and thimbleberry are minor shrub species that occasionally become established in small canopy openings. Surprisingly, even under low light conditions, the water saturated soils produce large quantities of lush forbs and graminoids from late May on through the summer months depending on aspect and elevation of the site. Common species include glacier lily, spring beauty, montia (Montia spp.), sweet cicely, angelica, false hellebore, arrowleaf groundsel (Senecio triangularis), monkshood (Aconitum columbianum), and a variable fern canopy composed of bracken and lady fern.

C. Huckleberry Shrubfields

Seral shrubfields dominated by Vaccinium species are located throughout the Cabinet Range, but are normally restricted to ridgetops and mid to high elevation south/west facing slopes where subalpine fir/beargrass habitat types occur. This open, low structured shrubfield is created and at times maintained by wildfire, although timber harvest and/or snowslides may have the same developmental effect. Due to effective fire suppression in primitive areas, the majority of huckleberry fields are transitional and progressing towards timbered shrubfield communities. Old burns exist as small two to ten acre openings along ridgelines where environmental conditions are harsh, with small regenerating conifers slowly encroaching on these sites. More recent burns support extensive stands of huckleberry, which are vigorous in growth and fruit production (an excellent example being the burned over basin of the East Fork McKay Cr.).

Vegetation composition is similar to that found in the climax subalpine fir/beargrass/globe huckleberry understory, but typically more developed. The shrub canopy is low, 1 m or less, and dominated by globe huckleberry and grouse whortleberry, which grow in association with beargrass a rhizomatous forb that occurs in dense clumps underneath and around shrubs. Minor species such as mountain lover (Pachistima myrsinites), mountain ash, and menziesia are localized and scattered in the shrub canopy. The few common forbs and grasses include arnica (Arnica latifolia), yarrow (Achilles millefolium), and elk sedge, in the southern portions of the East Cabinets, grouse whortleberry forms dense low lying mats are dry, gravelly ridges.

Timber harvested units in the subalpine fir types show variable shrub-forb responses. Clearcuts not scarified, especially those broadcast burned or on southern aspects have responded favorably, resulting in a thick and productive huckleberry stratum.

V. Riparian Stream Bottom

Low to high gradient stream bottom habitat is identified by riparian plant associations which reflect the influence of increased soil moisture along hydrologically active zones. Considerable variation in vegetation composition, structure, and even between plant communities exist, with some sites being open, some timbered, and still others forming a diverse mosaic of small irregular meadows, shrubfields, and forested blocks. The development and extent of vegetatively diverse riparian habitat is strongly dependent on timber canopy closure and stream channel gradient. Creek and river bottoms of relatively level topography have high water tables, causing water backup and stream meandering. These riparian zones are broad, heterogenous, and extremely productive. The Bull River Valley, which dissects the East and West Cabinets is excellent low gradient habitat, composed of black cottonwood, spruce (Picea spp.), and cedar timber types interspersed by small wet meadow, large wet hay meadows, forb dominated streambanks, and riparian shrubfields. As discussed previously, a majority of stream bottoms occur in the western red cedar/devil's club or western hemlock/beadlily habitat types, and have a closed forest canopy with a limited understory. In this climax state, such sites are of little value as foraging habitat. Where the overstory has been removed naturally or artificially by wildfire, snow slides, or past spruce-salvage operations, the undergrowth has responded favorably and developed a lush graminoid-forb stratum. Old and recent beaver activity has also had the same type of ecological effect in many Cabinet drainages, producing hundreds of acres of high quality riparian habitat and adding diversity to already prolific low gradient stretches. Riparian zones along high gradient stream bottoms are narrowly restricted to stream banks with a visible and abrupt transition with adjacent well drained forest types. Regardless of the gradient, most open stream corridors are dominated by herbaceous meadows and riparian shrubfields. Common shrubs include alder, red-osier dogwood (Cornus stolonifera), willow, twin-berry (Lonicera involucrata), and buckthorn (Rhamnus alnifolia). Forbs and graminoids are extremely abundant, often forming a layer of 1-2 meters tall consisting of fern species (Polypodiaceae), horsetails (Equisetum spp.), licorice root (Ligusticum canbyi), angelica, cow parsnip, meadow rue, monkshood, etc.

VI. Marsh

Marshes are open sedge (Cyperaceae) dominated communities that are perennially moist, often containing standing or slow moving water, and located in slightly concave depressions along level, poorly drained valley bottoms or in u-shaped stream channels. Marshes exist as either unbroken monotypic communities or as infringing zones around open shallow lakes and ponds. Ecotone boundaries are well defined and commonly bordered by contiguous western hemlock forest, occasionally having a narrow spirea shrub ring (Spiraea douglasii) on slightly better drained soils. Marsh vegetation forms a .5-1 m sedge layer composed of Carex spp. and bulrushes (Scirpus). Alder may grow as scattered clumps through the community. Few forbs are found in association with marsh habitat.

VII. Wet Meadow

These are mesic graminoid dominated communities located along flat low elevation watersheds, and in slightly concave depressions of varying sizes at high elevations. Low elevation wet meadows in the Cabinets are limited to wide river and creek bottoms, and are delineated as portions of surrounding riparian habitat. Most of these sites have been cleared for haying purposes and are dominated by domestic grasses and various sedges. High elevation wet meadows are distinct physiographic climax communities that commonly occur in upper basins throughout the East and West Cabinets. Persistent snow retention and cool temperatures retard phenological development of high meadows until mid-late July, and drainage from snow fields and vertical basin headwalls tends to keep soils well saturated through the growing season.

Floristic composition varies between and within open meadows, forming distinct graminoid associations depending on slight differences in soil moisture. Sites with standing or running water typically have short uniform sedge communities composed of sedges and rushes, with horsetail shoots intermixed. On slightly drier soils dense stands of bluejoint reedgrass (Calamagrostis canadensis) occur as irregular islands between sedge groups, or as exclusive "Caca" meadows with seed stalks reaching up to 2 m in height. Forb growth is marginal, with sitka valerian (Valeriana sitchensis), arrowleaf groundsel, and licorice root commonly encountered along perimeter ecotones. Alder and willow shrub stringers occasionally grow through and around certain meadow communities, while low lying mats of alpine laurel (Kalmia polifolia) and mountain heather (Cassiope mertensiana) are associated with other sites.

VIII. Dry Meadows

These are open graminoid dominated sites with level or gradual sloping topography, most commonly occurring at low elevations. Dry meadow openings are created through timber harvest operations, livestock grazing and wildfire. Soils are ephemerally moist in the spring but dry out rapidly later on and remain in a relatively xeric condition through the summer and fall. A number of large, heavily scarified clearcuts along the east side of the East Cabinet Range and in the Bull River Valley are dominated by scattered opportunistic graminoid-forb communities. On adjacent private lands exist cleared meadow that are maintained by livestock grazing and are composed primarily of domestic perennial grasses and various forbs. Dry meadows also develop as short-lived seral communities following intensive fire on certain sites. In 1979, approximately 1700 acres of closed hemlock and Douglas fir forest was burned in the Granite-Deep Creek area, and has since then developed a robust layer of grasses and fire adapted forbs. Other disturbed sites, including roads and old skid trails that have seeded in well with introduced grasses (Timothy (Phleum pratense), orchard grass (Dactylis glomerata)) were considered as dry meadow components due to the similarity of plant associations. Dry Meadow vegetation composition is variable depending on the severity of soil disturbance and topographic position of the site, and unless maintained, most sites slowly reestablish shrub or regenerating conifer canopies.

IX. Drainage Forbfields

These are open high elevation herbaceous fields with gradual to steep topography. Forbfields exist as small irregular components where sufficient soils have accumulated at the base of rock headwalls, along moraine deposits, or near alpine ridgetops with semipermanent snowfields. Snowmelt draining off rock and percolating through shallow stony soils provides an endless supply of water through the growing season. Of the mesic components delineated, drainage fields are latest in phenological development, a number of forb species continuing to grow and flower into September and October. The forb layer may either be low, near ground level or .5 M tall and very dense. Dominant plant species growing on most sites are glacier lily, arrow leaf groundsel, angelica, sitka valerian, lousewort (Pedicularis spp.), sky-pilot (Polemonium pulcherrimum), and columbine (Aquilegia flavescens). Forbfields are often associated with alder shrubfields and talus, forming a component mosaic over upper basin slopes.

X. Snowchutes

Open forb dominated snowchutes are the result of recent massive snow slides that remove both tree and shrub cover. The majority of existing avalanche paths in the Cabinet Mountains are dominated by tall shrub communities (mixed shrubfield/snowchute and alder shrubfield) having been maintained over thousands of years. Few large slides are released in timbered zones annually, with only five snowchutes documented in the East Cabinet Range over the past five years (A. Bratkovich 1982 pers. comm.). Thus snowchutes in early successional herbaceous stages are uncommon, and govern a site for a few short growing seasons prior to shrubfield development. Where this component does exist, it commonly occurs as long narrow chutes or small 2-10 acre patches at the toe ends of shrubfield/snowchutes. The lush forb stratum is similar in composition to that growing under the shrubfield canopy, but considerably more robust and dense in structure. Succulent key bear foods are abundant and include glacier lily, spring beauty, angelica, cow parsnip and false hellbore.

XI. Sidehill Park Habitat

Sidehill parks are open graminoid and/or forb dominated communities on moderate to steep slopes from mid-montane to high elevations. They are the result of local topographic, edaphic, and climatic influences, which in combination limit tree growth and form parks of variable floristic composition. Sidehill parks are distinguished from meadow habitat by being inclined with convex topography, and having dissimilar plant communities.

Sidehill park habitat is subdivided and delineated as two component types based on differences in vegetation composition and structure.

A. Graminoid Sidehill Parks

Open graminoid parks are located throughout the Cabinet Range and are variable in structure and size depending on local environmental factors. Where shallow soil conditions exist over slabrock or in

association with exposed benches of bedrock sidehill park openings are relatively small and irregularly shaped. These are found in all aspects in the Douglas fir and subalpine fir zones along high ridges and upper slopes, and may remain perennially moist, or more commonly become dry through the summer months. Ecotone boundaries on such sites are often abrupt with shrubfield or timber communities, forming a diverse mosaic of vegetation types. Xerophytic parks are dominated by bunchgrass, particularly bluebunch wheatgrass (Agropyron spicatum) and Idaho fescue (Festuca idahoensis), with a number of forb species emerging and flowering from storage organs early in the season while ample soil moisture exists. Biscuit root, glacier lily, spring beauty, buckwheat-umbrella plant (Eriogonum flavum and E. heracleoides), alumroot (Heuchera cylindrica), and indian-paintbrush (Castilleja spp.) are common sidehill park forbs. Sedges are more prevalent on sites that receive slow but continuous drainage from higher terrain and often occur as terraced benches, occasionally approaching a wet meadow condition (and should then be classified as such).

In certain drainages at somewhat lower elevations in the Douglas fir type, large graminoid parklands occur over well developed soils on south and southwestern slopes. Here the topography channels air flow so that strong winds both remove protective snowpack off southerly slopes and dry soils out deeply later in the summer months (Daubenmire 1968). Areas adjacent to the East Cabinet Range, including tributary drainages of the Fisher River such as Horse Mtn.-Miller Creek and the lower Silver Butte, but also the lower west flanks of Lake Creek exhibit these topo-edaphic climax communities. Vegetation composition is similar to that of dry graminoid-slabrock parks but more extensive and often more productive. Bunchgrasses and other grass-sedge species are vigorous in growth. Additional forbs commonly growing in lower sidehill parks to those previously visited include balsamroot (Balsamorhiza sagittata), lupine (Lupinus spp.), yarrow, penstemon (Penstemon spp.) and pussy-toes (Antennaria racemosa). Douglas fir and ponderosa pine (Pinus ponderosa) are frequently scattered through park openings, both as large mature conifers and seedlings.

B. Beargrass Sidehill Park

Beargrass, or Indian basket-grass is a grasslike perennial forb that grows in dense rhizomatous clumps. It's found in association with a number of forest habitat communities, and at higher elevations dominates and constitutes certain sidehill park habitat. Beargrass parks are generally located on shallow, well drained soils of south to westerly aspects, existing as large homogeneous openings along upper slopes and ridges, or as small irregular patches on basin headwalls adjacent to lakes, wet meadows, and shrubfields. Ecotone edges with subalpine timber are gradual, with conifer seedlings often scattered through park components. Ground coverage exhibited by beargrass varies depending on soil development and moisture conditions of the site. Some parts may form dense fields of beargrass to the near exclusion of other vegetation. Concomitant plant species include graminoids, glacier lily, alpine knotweed (Polygonum phytolaccaefolium), penstemon, and hawkweed (Hieracium spp.).

Huckleberry, grouse whortleberry, mountain lover, and mountain ash may be present on certain sites.

- XII. Slabrock habitat characterizes open sites of exposed blocks of scoured-glaciated bedrock, occurring at high elevations on steep to gentle topography. As previously defined (See Graminoid Sidehill Park pp. 15) graminoid dominated communities are closely associated with slabrock where adequate soil development over and between joint blocks support vegetative growth. Other components, such as wet meadows and huckleberry shrubfields are also located as variable sized strips following soil that has accumulated in crevices and depressions. In subalpine basins and on ridgetops, slabrock community mosaics are extensive across gradual convex terrain, providing a high degree of habitat diversity, isolation, and abundance of key bear foods. The upper basins of Ross Creek in the West Cabinets and the numerous small cirques around the Chicago-St. Paul Peaks area in the East Cabinets exhibit large slabrock complexes.

Because of the difficulty in separating and mapping slabrock habitat as discrete units, sites are delineated by the associated vegetative component and secondarily identified as slabrock base (i.e., graminoid sidehill park/slabrock). Slabrock alone has little to no vegetative cover. Seasonal use and importance of slabrock mosaics are determined from the existing vegetation type and development of key bear food.

XIII. Talus/Scree/Rock

This component represents very steep to moderate slopes and benches of loose rock fragments of variable size. unstable scree and talus slopes occur over a broad elevational range with little soil development. Fields of large angular blocks of rock are common in small cirque basins on gradual slopes and benches. Vegetation is sparse, but rock fields often border and drain into wet meadows, drainage forbfields, and alder shrubfields. These and large fragment talus slopes are used as feeding and reproduction habitat by a number of small mammals that grizzly may occasionally prey upon.

Appendix Table 17. Criteria for verification of grizzly bear sightings or sign (compiled by R. Kuennen, USFS and W. Kasworm, MDFWP).

The following criteria have been established in order to ensure that there is consistency in what is reported as credible grizzly sign or observations. Sign or observations which meet these criteria should be reported each winter for placement on the forest map. Please report as much information as you have on each sighting--preferably on the attached observation card, and attach a map. The person who gets the report of the sign should sign their name under "verification by." Two types of sign make a stronger report than one.

Hair - An experienced person has looked at the hair and verified it as grizzly. Please report the name of the person doing the verification (can be sent to Bozeman lab of MDFWP).

Scats - Scats are not acceptable as verified evidence unless they contain hair verified as grizzly, or until Picton's method for identifying grizzly and black bear scats has been established. Researchers feel that scat diameter and volume are not reliable criteria unless substantiated by other sign.

Digs - A single dig or series of digs where sod is turned over in a extensive area, usually at a high elevation location. Other animals don't dig up extensive areas for bulbs, but make sure you can rule out badger digs for ground squirrels and stumps ripped up or rocks turned over by black bears. A rough rule-of-thumb is that if an area of sod greater than 4' x 4' has been dug up it should be reported as grizzly.

Tracks - The most reliable criteria is if the distance of the claws from the front toe pads is measured and reported. If the front claws are 1 3/4" or more from the pads it should be reported as grizzly. If claws are not observed, then a front pad width greater than 5 1/2" or a back foot length greater than 9" could be grizzly. Observers should also compare the shape of the pad to that drawn on the attached identification card to see if it had the distinctive grizzly shape. Grizzlies may have smaller tracks than the limits listed above, but they will not be counted unless substantiated by hair or other sign in the area. These dimensions are based on a sample of 40 measurements of black bear feet collected by Montana Department of Fish, Wildlife and Parks in the Cabinet Mountains. The largest black bear foot measurements were:

	<u>Pad Length</u>	<u>Pad Width</u>	<u>Foot Length</u>	<u>Toe-to-Claw</u>
<u>Front</u>	3 1/8"	5"	5 1/8"	1 3/8"
<u>Rear</u>	6 1/2"	4 7/8"	8 1/4"	

Reports of "large" tracks will not be counted unless accompanied by at least a relative measure or a photograph. The substrate should also be reported. Melted out tracks in the snow may appear larger than they actually were when layed down.

Dens - Must be accompanied by hair or a good track measurement to be considered grizzly. One collared black bear in the Cabinets denned at 6500', so elevation alone is not necessarily reliable.

Observations

When verifying reports of observations it is important to consider three basic types of information; 1) amount and kind of information regarding report, 2) distance which bear was observed from, length of time, and weather, 3) subjective evaluation of interviewer about observer's reliability. Please list any information you have in these three areas when reporting observations. Things to consider when you are determining the credibility of an observation are listed below:

1. Amount and kind of information regarding report.

Very credible = observation of long claws, grizzled coat, or silvertipping. Grizzlies may also have low or rounded ears, a hump or massive shoulders, dark legs or a saddle, or a dish-shaped face (although Thier observed a grizzly in the Cabinets which didn't have a hump or a distinctive dish face).

Credible = the claws were not observed, but several of the other grizzly characteristics were mentioned.

Not credible = a big bear, a brown bear mentioned but other characteristics not observed.

When questioning people ask them to give you the best description of the bear they can and of what it was doing. Try not to lead them too much. Do not say "did it have a hump or grizzled coat," etc. If the bear was observed digging in an avalanche chute, for instance, it helps add credibility to the sighting.

2. Distance bear observed from, length of time, weather.

Very credible = good weather or light, bear observed for more than five minutes from less than 50 yards or from farther away with binoculars, a scope, etc. Try to get the person to estimate the time and distance of the observation.

Credible = same as above but bear observed for a shorter length of time.

Not credible = bear observed "in a flash" -- i.e., running across a trail or road as it disappeared into the brush, or at greater than 50 yards without a scope or binoculars.

3. Subjective evaluation of interviewer about observer's reliability.

This is a very important factor when turning in observations. Consider and report the following in determining reliability:

- whether the person appears to be making rational judgments about what they've seen.
- if the person has worked with grizzly bears, or hunted bears.
- if the person has biological experience or training.

- if the person has spent a lot of time in prime grizzly bear habitat through their job or recreation.

4. Validation by reporter

Very credible (5 rating) = interviewer is convinced beyond a reasonable doubt that the sighting is credible and would be willing to stake their reputation on it.

Credible (4 rating) = interviewer feels pretty confident that the observer is reliable, but wouldn't stake their reputation on it.

Not credible (rating of 3 or less) = interviewer feels unsure of the observer's reliability.

801/5



